

AIRBORNE AG SYSTEMS LLC

Operational Manual

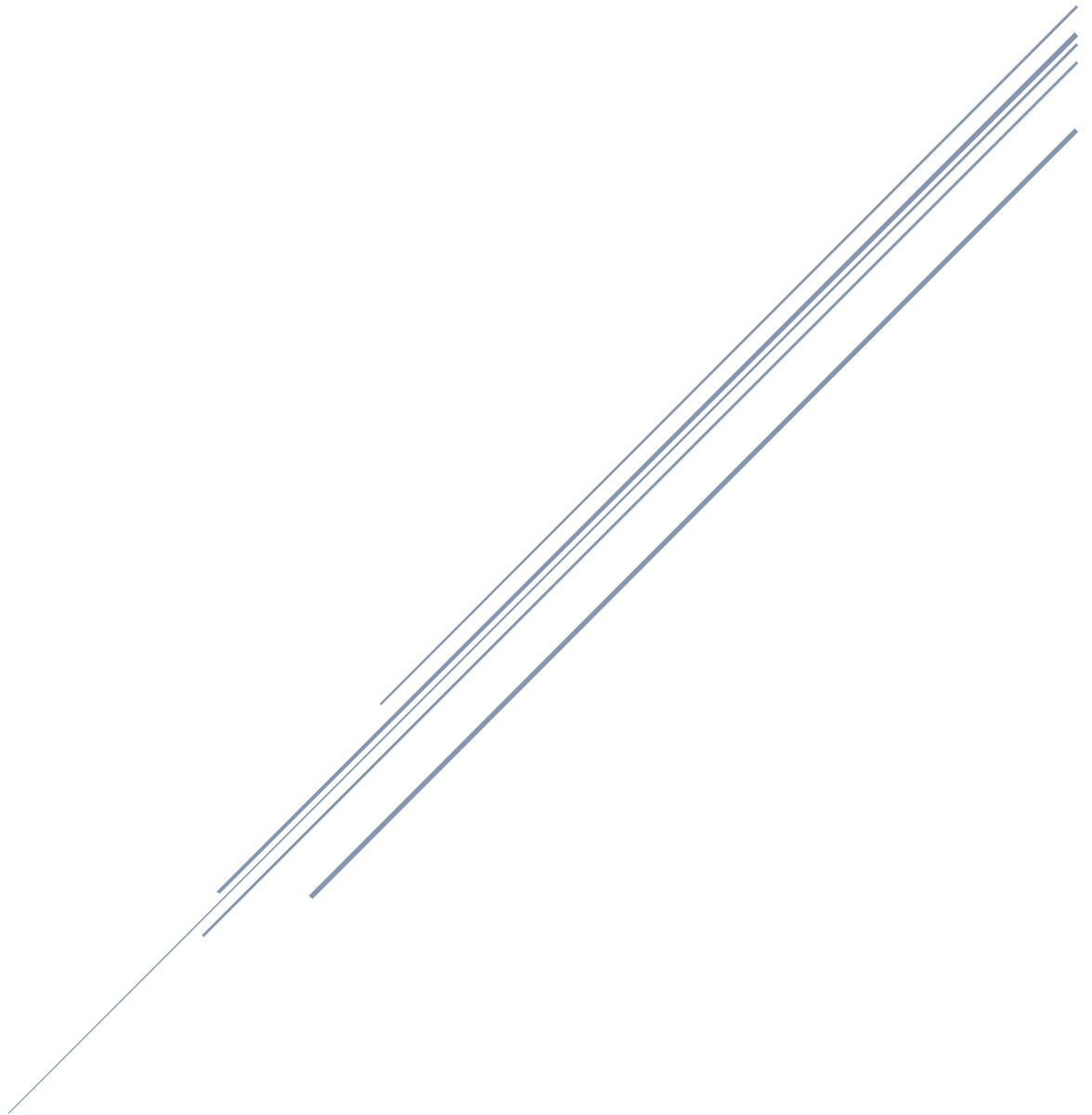


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1. Preface

The following procedures are intended to promote safe, efficient, and lawful operation of the Airborne Ag Systems LLC unmanned aerial system (UAS). Safety, above all else, is the primary concern in each and every operation, regardless of the nature of the mission.

2. Philosophy & Mission Statement

It shall be the mission of those personnel of Airborne Ag Systems LLC who are trained in the use of unmanned aircraft systems (UAS), to use this resource to conduct aerial spraying operations under FAA Part 137. When operating the UAS, Airborne Ag Systems LLC operators shall abide by all FAA Regulations for flight and receive the proper authorization for flight.

3. Administration

1. The policies and procedures contained in this manual are issued by Airborne Ag Systems LLC As such it is an official business document of Airborne Ag Systems LLC
2. This manual is not intended to be all-inclusive, but as a supplement to other company guidelines, Federal Aviation Administration regulations, pre-flight safety checklists, aircraft manufacturers' approved flight manual, etc.
3. This manual is been written to address UAS operations as they existed when it was drafted. Equipment, personnel, environment (internal and external), etc., change over time. The management of change involves a systematic approach to monitoring organizational change and is a critical part of the risk management process. Given this, it is essential that this manual be continually updated as necessary. The entire manual must be reviewed, at a minimum, annually to assure it is up to date. Any changes to the manual will be communicated as currently dictated by company policy.
4. A copy of the manual (electronic and/or paper) is issued to every person having UAS responsibilities

3.1 Personnel

The UAS Coordinator or Remote Pilot-in-command (RPIC) is responsible for the overall safety during UAS operations.

UAS Coordinator:

- The UAS Coordinator shall maintain a file for each operator and airframe. The file shall include copies of training records, flight incidents, maintenance records, etc.
- It is the responsibility of the UAS Coordinator to be current and to update the RPIC and observer with all federal and state regulations as they change;
- The UAS Coordinator shall ensure that the RPIC has all documents required as per FAA.
- The UAS Coordinator should ensure that the RPIC is current with the training and knowledge.

- It is the responsibility of the UAS Coordinator to ensure all UAS are registered and in airworthy condition.

Remote Pilot in Command (RPIC):

- To be considered for selection as an operator, applicants must meet the requirements for and successfully pass the FAA Remote Pilot Certification.
- An operator's primary duty is the safe and effective operation of the UAS in accordance with the manufacturers' approved flight manual, and FAA regulations. Operators must remain knowledgeable of all FAA regulations; UAS manufacturer's flight manual and bulletins and department policy and procedures.
 - Operators may be temporarily removed from flight status at any time by the UAS Coordinator, for reasons including performance, proficiency, physical condition, etc. Should this become necessary, the operator will be notified verbally and in writing of the reason, further action to be taken and expected duration of such removal.
- It is the responsibility of the RPIC to ensure all UAS are registered and in airworthy condition prior to UAS operations.

Visual Observer (As Needed)

- Observers must have been provided with sufficient training to communicate clearly to the operator any turning instructions required to stay clear of conflicting traffic and obstacles.
- An observer's primary duty is to operate the UAS's equipment including cameras, radio communications with RPIC, as well as be an observer for anything that may affect the RPIC's primary duty (see and avoid).

4. Safety

1. Airborne Ag Systems LLC is committed to having a safe and healthy workplace, including:
 - a. The ongoing pursuit of an accident free workplace, including no harm to people, no damage to equipment, the environment and property. Airborne Ag Systems LLC has a
 - a. culture of open reporting of all safety hazards in which management will not initiate disciplinary action against any personnel who, in good faith, disclose a hazard or safety occurrence due to unintentional conduct.
 - b. Support for safety training and awareness programs.
 - c. Conducting regular audits of safety policies, procedures, and practices.
 - d. Monitoring the UAS community to ensure best safety practices are incorporated into the organization.
2. It is the duty of every member within the UAS flight crew to contribute to the goal of continued safe operations. This contribution comes in many forms and includes always operating in the safest manner practicable and never taking unnecessary risks. Any safety hazard, whether procedural, operational, or maintenance related must be identified as soon as possible after, if not before, an incident occurs. Any suggestions in the interest of safety should be made to the UAS Coordinator.

3. If any member observes, or has knowledge of an unsafe or dangerous act committed by another member, the UAS coordinator is to be notified immediately so that corrective action may be taken.

5. Operational Hazard and Occurrence Report (OHOR) and Investigations

1. Occurrences are unplanned safety related events, including accidents and incidents that could impact safety. A hazard is something that has the potential to cause harm. The systematic identification and control of all major hazards is foundational to safety.

2. The OHOR concept provides a mechanism to report hazards and occurrences, real and perceived, to those responsible for UAS operations.

3. There is no specific format for the OHOR as the information provided is what is important, not the format and should be used without hesitation to report any anticipated, current, or experienced safety hazard, or occurrence. Further, the OHOR can be submitted anonymously, and to whatever level in the chain of command, to get the matter proper attention, without fear of reprisal.

4. Written memorandums fully explaining the problem will be given to the UAS coordinator for investigation.

5. Every hazard and/or occurrence is investigated, with the results and corrective action taken communicated to all members. The investigation will be conducted by the UAS coordinator or any other member of the company who has the technical skill necessary to do it. The services of an independent subject matter expert may be necessary in some cases to assure a thorough and complete investigation.

6. Hazards requiring immediate attention will be brought to the attention of the UAS coordinator, verbally, without delay.

7. ALL MEMBERS ARE AUTHORIZED TO TAKE ACTION TO CORRECT A HAZARD if in that member's opinion delay will result in accident or injury. The UAS coordinator will be notified immediately in such situations.

6. Safety Training

1. All members shall receive training in the following subjects prior to operating the UAS:

- a. Company commitment to safety
- b. Company policy
- c. UAS member's role in safety
- d. Emergency safety procedures

2. All members shall review the company safety policy and procedures on an annual basis and that review shall be noted in their training history.

6.1 Medical Factors

1. Operator and Observers shall only deploy the UAS when rested and emotionally prepared for the tasks at hand.
2. Physical illness, exhaustion, emotional problems, etc., seriously impair judgment, memory, and alertness. The safest rule is not to act as an operator or observer when suffering from any of the above. Members are expected to "stand down" when these problems could reasonably be expected to affect their ability to perform flight duties.
3. A self-assessment of physical condition shall be made by all members during preflight activities.
4. Performance can be seriously hampered by prescription and over-the-counter drugs. The UAS Coordinator must be advised anytime such drugs are being taken. If it is determined that the medication being taken could hamper an operator or observer, that member shall be prohibited from the deployment or exercise.
5. No member shall act as an operator or observer within eight hours after consumption of any alcoholic beverage, while under the influence of alcohol.

7. Chief Supervisor & Pilot Qualifications

14 CFR 137.19 Certification Requirements

General. An applicant for a private agricultural aircraft operator certificate is entitled to that certificate if he shows that he meets the requirements of paragraphs (b), (d), and (e) of this section. An applicant for a agricultural aircraft operator certificate is entitled to that certificate if he shows that he meets the requirements of paragraphs (c), (d), and (e) of this section. However, if an applicant applies for an agricultural aircraft operator certificate containing a prohibition against the dispensing of economic poisons, that applicant is not required to demonstrate the knowledge required in paragraphs (e)(1) (ii) through (iv) of this section.

Private operator - pilot. The applicant must hold a current U.S. private, , or airline transport pilot certificate and be properly rated for the aircraft to be used.

operator - pilots. The applicant must have available the services of at least one person who holds a current U.S. or airline transport pilot certificate and who is properly rated for the aircraft to be used. The applicant himself may be the person available.

Aircraft. The applicant must have at least one certificated and airworthy aircraft, equipped for agricultural operation.

Knowledge and skill tests. The applicant must show, or have the person who is designated as the chief supervisor of agricultural aircraft operations for him show, that he has satisfactory knowledge and skill regarding agricultural aircraft operations, as described in paragraphs (e) (1) and (2) of this section.

(1) The test of knowledge consists of the following:

- (i) Steps to be taken before starting operations, including survey of the area to be worked.
- (ii) Safe handling of economic poisons and the proper disposal of used containers for those poisons.

(iii) The general effects of economic poisons and agricultural chemicals on plants, animals, and persons, with emphasis on those normally used in the areas of intended operations; and the precautions to be observed in using poisons and chemicals.

(iv) Primary symptoms of poisoning of persons from economic poisons, the appropriate emergency measures to be taken, and the location of poison control centers.

(v) Performance capabilities and operating limitations of the aircraft to be used.

(vi) Safe flight and application procedures.

(2) The test of skill consists of the following maneuvers that must be shown in any of the aircraft specified in paragraph (d) of this section, and at that aircraft's maximum certificated take-off weight, or the maximum weight established for the special purpose load, whichever is greater:

(i) Short-field and soft-field takeoffs (airplanes and gyroplanes only).

(ii) Approaches to the working area.

(iii) Flare-outs.

(iv) Swath runs.

(v) Pullups and turnarounds.

(vi) Rapid deceleration (quick stops) in helicopters only.

7.1 Objective

1. The key to continued safe operations is by maintaining a professional level of competency. The first step in this process is establishing minimum qualifications for selecting members, and the second step involves training those personnel to meet the pilot certification requirements for UAS.

7.2 Instructors

1. If any members are FAA certified flight instructors, they are given instructor duties. Such duties can include developing training courses, provide training, and student evaluation and documentation.

2. Duties of instructing new members shall fall upon those who have the most flight time and knowledge of UAS operations. Instructors are designated by those within the unit and approved by the UAS Coordinator.

7.3 Training Plans

1. All members have a training plan on file that outlines training objectives for the upcoming year. This training plan will be held in conjunction with the member's normal training file per company policy.

2. The approved training plan is developed by the UAS coordinator.

3. All deployments or exercises are documented and count toward a member's training.

4. It is the member's responsibility to verify their training file contains all pertinent information.

7.4 Initial Training

1. Observers and Operators must have completed sufficient training to communicate to the pilot any instructions required to remain clear of conflicting traffic. This training, at a minimum, shall include knowledge of the rules and responsibilities described in 14 CFR 91.111, Operating Near Other Aircraft; 14 CFR 91.113, Right of-Way Rules: Except Water Operations; and 14 CFR 91.155, Basic VFR Weather Minimums; knowledge of air traffic and radio communications, including the use of approved ATC/pilot phraseology; and knowledge of appropriate sections of the Aeronautical Information Manual.
2. In conjunction with fulfilling all training requirements for operator/observer duties, the new member must also become familiar with UAS operations, the aircraft, and its equipment. Airborne Ag Systems LLC Unmanned Aircraft Systems Operations Manual
3. Any new member who fails to successfully complete the initial training may be denied as a member of the UAS flight crew.
4. Before a member can fly as an operator, they must complete at least 20 hours of flight training with the UAS instructors to show proficiency of the flight training exercises and the airframe. This must be accomplished to show their ability and knowledge of the UAS.
5. All Pilots shall meet or exceed the requirements of 14 CFR 137.19 Certification Requirement.

7.5 Recurrent Training

1. All members within the unit shall maintain proficiency in their operator/observer abilities. Members who do not have any documented training or flight time within a span of 90 days will have to show proficiency before being an operator/observer during a deployment or exercise.
2. Recurrent training is not limited to actual operating/observer skills but includes knowledge of all pertinent UAS/aviation matters.
3. Failure to prove proficiency can result in removal from UAS responsibilities.

7.6 Miscellaneous

1. Depending on the nature of the training request, all efforts are made to accommodate the hours of training so as little impact is made to staffing levels.
2. All requests for training shall be approved through the member's chain of command and timekeeping during those training hours are marked by the UAS coordinator.
3. Members are encouraged to attend, and forward information on FAA sponsored safety seminars.
4. Training shall only be conducted at approved locations and follow the provisions within the approved FAA regulations.

8. Pre-Flight Procedures

§ 107.49 Preflight familiarization, inspection, and actions for aircraft operation.
Prior to flight, the remote pilot in command must:

(a) Assess the operating environment, considering risks to persons and property in the immediate vicinity both on the surface and in the air. This assessment must include: (1) Local weather conditions. (2) Local airspace and any flight restrictions. (3) The location of persons and property on the surface; and (4) Other ground hazards.

(b) Ensure that all persons directly participating in the unmanned aircraft operation are informed about the operating conditions, emergency procedures, contingency procedures, roles and responsibilities, and potential hazards;

(c) Ensure that all control links between ground control station and the unmanned aircraft are working properly;

(d) If the unmanned aircraft is powered, ensure that there is enough available power for the unmanned aircraft system to operate for the intended operational time; and

(e) Ensure that any object attached or carried by the unmanned aircraft is secure and does not adversely affect the flight characteristics or controllability of the aircraft.

8.1 Environmental Considerations

- Always fly at locations that are clear of building and other obstacles.
- DO NOT fly above or near large crowds or bystanders.
- Avoid flying at altitudes above 98 feet (30 m).
- Fly in moderate weather conditions with temperatures between 32° to 104° F (0° to 40° C).
- Ensure that your operations do not violate any applicable laws or regulations, and that you have obtained all appropriate prior authorizations. Consult the relevant government agency or authority, or your lawyer before flight to ensure you comply with all relevant laws and regulations.
- DO NOT operate any parts of the aircraft indoors

8.2 DJI T-30 Calibration Procedure if Required

Choose an open space to carry out the following procedures. It is recommended to calibrate the compass with an empty tank.

1. Go to the app and tap Perform an Operation to enter Operation View. Tap the Aircraft Status Bar at the top of the screen and select Calibration in the Aircraft Status List, then follow the onscreen instructions.
2. Hold the aircraft horizontally and rotate it 360 degrees around a vertical axis until the Aircraft Status Indicators change to solid green and the display goes to the next step in the app.
3. Hold the aircraft vertically, with its nose pointing upward, and rotate it 360 degrees around a vertical axis.

8.3 Post Flight Procedures

- ☐ Aircraft Turned Off.
- ☐ Transmitter Turn Off
- ☐ Batteries Remove form DJI T-30.
- ☐ Remove any Fluid form Tank.
- ☐ Fluid shall be placed in a Safe Container.
- ☐ Clean and Flush Tank with Water if Needed.
- ☐ Clean the Aircraft and Dry Off any Moisture/Liquid
- ☐ Inspect the Aircraft for any Damage. (If Damage is Found Use Maintenance Reporting Form)
- ☐ Inspection of Propellers after Flight.
- ☐ Place Batteries on Charge when back to Office.
- ☐ Complete any Forms not Completed Prior to Flight.
- ☐ Aircraft shall be ready for Next Flight.

9. Standard UAS Operations

1. The UAS RPIC should launch, operate, and recover from preset locations so that the aircraft will fly according to the mission plan.
2. After the UAS is launched, the flight crew should have a clear view of the aircraft at all times, called Visual Line of Sight (VLOS). Observation locations should be selected for the maximum line of sight throughout the planned flight operations area (Part 107.31).
3. All flight operations must be conducted using a minimum of a RP and PMC per Part 107.31. However, it is advisable to utilize one or more VO's, as outlined in Part 107.33, depending on the complexity of the flight mission to perform general safety, visual observation, hazard and traffic avoidance (Part 107.37).
4. To ensure the flight is going according to the flight plan, the RP, PMC, and VO (if used) must be able to maintain effective communication with each other at all times (Part 107.33).
5. The visual observer should be informed on what the aircraft is supposed to be doing and the altitude of the aircraft above ground level.
6. Part 107.39 does not permit UAS flights over persons not directly involved in the operations. Flights taking place over populated areas, heavily trafficked roads, or an open-air assembly of people is not allowed under regulation (unless through waiver). If the mission dictates that flight operations be conducted in such areas, the RPIC will need to obtain a waiver before conducting a flight.
7. The observer should make the pilot aware of any possible flight hazards during the flight.

8. Upon any failure during the flight or any loss of visual contact with the UAS, the RPIC should command the aircraft back to the recovery location or utilize the built-in fail-safe features to recover the aircraft. Emergency procedures as defined in the specific UAS operator's manual should be followed.

9.1 Emergency Procedures

Emergency procedures are specific to each UAS type as designed by the manufacturer. It is the responsibility of the flight crew to be proficient with the aircraft operational manual provided by the vendor before any flight operations are conducted. It is also a best and safe practice to prepare an Emergency Checklist (Figure 3) in case of emergencies. The RPIC should always be prepared to execute an emergency procedure in instances where there is a lost link, loss of GPS, or there are other aircraft or obstructions in the flight path. He/she should brief the flight crew before the start of the flight operations about emergency procedures and have a mission abort site for landing in the case of an emergency. After the aircraft has safely landed, it should be documented for maintenance purposes. Some possible emergencies due to system failures are as follows:

- Loss of Datalink communications
- Loss of GPS
- Autopilot Software error/failure
- Loss of Engine power
- Ground Control System failure
- Intrusion of another aircraft into the UAS mission airspace

This is not meant to be a comprehensive list as the types of failures and associated emergency conditions vary for different UAS, airspace events, and crew performance.

Many UAS have a number of failsafe options in case of failures or emergency situations.

These include using methods of stabilization and an automated Return to Land (RTL) or Loiter mode. Other features include fail-recovery software. The specific failsafe options available for each type of UAS should be outlined in the UAS documentation (Operator's Manual, Checklists, etc.). These fail-safe mechanisms should be tested during training and currency flights. Flying without these fail-safe mechanisms in place is not recommended.

An emergency avoidance procedure should be determined before landing. Options include land immediately, move to a predetermined location and altitude, or another approach. All possible incursions must be assessed for risk mitigation.

In the event of a lost link or fly away, the RPIC should evaluate the airspace affected and contact the appropriate controlling agency (i.e. control tower, airport manager, Center, Restricted Area agency, etc.) immediately with details of the flight such as; location, direction of flight and approximate altitude, speed and flight time remaining (remaining battery life) .

In the event of an emergency the RPIC should be prepared to submit a written statement on any deviations upon the request of the Administrator (FAA) as outline in Part 107.21.

10. Accident Reporting Procedures

§ 107.9 Accident Reporting

No later than 10 calendar days after an operation that meets the criteria of either paragraph (a) or (b) of this section, a remote pilot in command must report to the FAA, in a manner acceptable to the Administrator, any operation of the unmanned aircraft involving at least:

- (a) Serious injury to any person or any loss of consciousness; or
- (b) Damage to any property, other than the Unmanned aircraft, unless one of the following conditions is satisfied:
 - (1) The cost of repair (including materials and labor) does not exceed \$500; or
 - (2) The fair market value of the property does not exceed \$500 in the event of total loss.

10.1 Accident Reporting Form #EDC-004-T-30

- (a) This form shall be filled out by the RPIC at time of the incident.
- (b) Form shall be filled out within 24 hours of the incident.
- (c) Form will be filed with the office manager on duty.

11. Spray Log Procedures

- (a) Form EDC-002 Spray Record Forms shall be filled out at the end of each operation.
- (b) Until we receive certification and training from the certified handler will load the product into the tank of the DJI T-30.
- (c) Please verify credentials of the handler of the product.
- (d) Any questions contact the Chief Supervisor of Operations.

12. Maintenance Procedure for the DJI T-30

- (a) Refer to owner manual for recommended routine maintenance procedures.
- (b) A printed version of the owner's manual will be in the binder for each aircraft.
- (c) Any maintenance performed on the DJI T-30 shall be recorded on form #EDC-003-
- (d) Notify Chief Supervisor of any maintenance concerns or parts replacement.
- (e) After any parts are replaced an air worthiness test shall be performed.

13. Standard EDC Drone Forms

(a) Form EDC-001 T-30– Maintenance/Inspection Record

1. Shall be filled out after each mission
2. Reviewed every 30 days by the Chief Supervisor of Operations

(b) Form EDC-002 T-30 Spray Record

1. Shall be filled out after each mission
2. Reviewed every 30 days by the Chief Supervisor of Operations
3. This form is a record of any spraying that is performed by the Agra T-304. Important to make sure this form is accurate and ready for review at any time.

(c) Form EDC-003 T-30Maintenance Reporting Form

1. Shall be filled out any time a component is repaired or replaced.
2. This form will provide the Chief Supervisor of Operation a more detailed report of what was perform.
3. This form will be given directly to the Chief Supervisor of Operations for immediate review.

(d) Form EDC-004 T-30Accident Reporting Form

1. Shall be filled out in detail of within 6 hours of the accident or damage to personal property.
2. Reviewed by the Chief Supervisor of Operations and a RPIC interview may take place to gather the fact of the incident.
3. If damage is over \$500 the FAA shall be notified of the event.
4. Accident reporting can be done through the FAA Drone Zone web site.

(e) Form EDC-005 T-30Pre/Post Flight Checklist

1. Shall be followed on each mission.
2. Reference to provide the safest mission possible.
3. Safety is the most important part of your mission.
4. If there are any immediate safety concerns contact the Chief Supervisor of Operation.

5. If the Chief Supervisor of Operations is not available ABORT the mission until the safety concern can be addressed